



health

Department:
Health
REPUBLIC OF SOUTH AFRICA



COVID-19 Disease: Infection Prevention and Control Guidelines

Version 1

April 2020

Foreword

The World Health Organization (WHO) declared COVID-19 a global pandemic on 11th March 2020. The first case was diagnosed in South Africa on 5th March 2020. South Africa faces a particular challenge given the large vulnerable immunocompromised population living in overcrowded conditions.

This guideline provides guidance regarding infection prevention and control in healthcare facilities with specific reference to COVID-19. It should be read in conjunction with the National Infection Prevention and Control Strategic Framework and the Practical Manual for the Implementation of the National Infection Prevention and Control Strategic Framework both of which were released during March 2020.

These guidelines are likely to change as knowledge regarding strategies to address COVID-19 develop globally and in South Africa. The guidelines will be updated regularly based on emerging evidence and WHO recommendations.

The Department would like to thank Prof Shaheen Mehtar who drafted the guideline on behalf of the Infection Prevention and Control Technical Working Group (Angela Dramowski, Briette Du Toit, Ronel Steinhobel, Marina Aucamp, Yolanda van Zyl and Marc Mendelson).



Dr T Pillay
Acting Director-General: Health
Date: 08/04/2020.

Table of Contents

1. Introduction	3
2. Strategic Framework	3
3. Characteristics of SARS CoV-2	3
3.1. Routes of Transmission	3
4. Administrative controls: IPC Precautions for COVID-19 containment in health care facilities	4
4.1. Roles and responsibilities of managers and staff	5
4.1.1. All staff	5
4.1.2. Laboratory staff	5
4.1.3. Clinical staff	5
4.1.4. Facility IPC team	5
4.1.5. Occupational health	5
4.1.6. Visitors	5
5. Environmental Controls for IPC measures in COVID-19	5
5.1 Patient Placement	5
5.1.1 Single room	6
5.1.2 Cohort isolation	6
5.2 Intensive Care	6
5.3 The built environment	6
5.3.1 Ventilation	6
5.3.1.1 Hospital accommodation	6
5.3.1.2 Operating Theatres	6
5.3.1.3 Maternity-labour ward	7
6. IPC Controls for COVID-19 containment	7
6.1 Standard Precautions	7
6.2 Transmission-based Precautions for COVID-19	7
6.3 Aerosol generating procedures (AGP)	8
6.4 IPC Signage	9
7. Hand hygiene	9
7.1 Why?	9
7.2 Types of hand hygiene	10
8. Appropriate use of Personal Protective Equipment	11
8.1 Types of PPE to use	11
8.2 Type of face covers	12
8.2.1 Face masks	12
8.2.2 N95 Respirators	13
8.2.3 Cotton masks for healthcare workers	14
8.3 Extended use of PPE	14
8.4 Donning and doffing of PPE	14
8.5 Norms for PPE requirement	16
9. Environmental cleaning	17
10. Bodies, burial and post mortem	18
10.1 Dead Bodies	18
10.2 Post mortem (autopsy)	18
10.3 Family member	19
11. Repatriation and subsequent quarantine	19
12. Summary	19
Appendix A: Detailed recommendation for use of PPE	20

1. Introduction

The World Health Organization (WHO) declared COVID-19 a global pandemic on 11th March 2020. SARS CoV-2 (a novel coronavirus) originated in Wuhan, China where the first cases were reported in late December 2019, and spread rapidly across the globe. The first case was diagnosed in South Africa on 5th March 2020 and by 27th March, more than 1000 people had tested positive for SARS-CoV-2. The rapidity of spread across the globe, has demonstrated unprecedented transmission, albeit of a mild disease in 80% of those who have tested positive for the virus. South Africa has a unique challenge of a large vulnerable immunocompromised population living in overcrowded conditions.

The Ministerial Advisory Committee on Coronavirus Disease 2019 (MAC-COVID 19) was formally established on the 25th March, with its first Clinical Committee meeting on the 26th March 2020. The Infection Prevention and Control (IPC) subgroup was charged with advising the Department of Health regarding evidence-based guidance towards the reduction and prevention of transmission in both patients and staff at community and healthcare facility level. These guidelines are aimed at health care facilities.

2. Strategic Framework

- The National Infection Prevention and Control Strategic Framework, March 2020
- Practical Manual for the Implementation of the National IPC Strategic Framework, March 2020
- WHO recommendations for COVID-19 (2020a). Deliberations of the COVID 19 Expert Committee will be used to update these guidelines.

3. Characteristics of SARS CoV-2

SARS-CoV-2, a novel coronavirus, likely originating from a bat, with undefined intermediate animal host, has recently been discovered in humans. Person to person transmission is rapid causing large community outbreaks across the globe. The virus infects and locally colonises the human nasopharynx and upper respiratory tract, later affecting the lower respiratory tract leading to pneumonia, respiratory failure and sometimes death (variable case fatality rates reported 1-5%). It is an enveloped virus which makes it fragile and vulnerable to heat, chemicals and ultraviolet sunlight.

3.1. Routes of Transmission

There are only two known routes of transmission (WHO recommendations¹)

- Via **respiratory droplets** produced via sneezing, coughing which is directly inhaled person to person
- Via respiratory droplets landing on environmental surfaces surrounding the infected person (also known as the **patient zone** and the **health zone**)² which are then transferred by the contact route via contaminated hands to a person's face and mucous membranes.

¹ Rational Use of personal protective equipment (PPE) for coronavirus disease (COVID-19) WHO, interim guidance, 19th March, 2020

² National Department of Health. National Practical Manual for the Implementation of the National IPC Strategic Framework, March 2020, p 23. Available from: (<http://www.health.gov.za/index.php/antimicrobial-resistance/category/629-infection-prevention-and-control-documents>)

No airborne transmission has been recorded except during aerosol generating procedures (AGP) in close proximity.³ In an analysis of 75,465 COVID-19 cases in China, airborne transmission was not reported.⁴

When aerosols are generated during coughing and sneezing, the larger size droplets fall on surfaces surrounding the source person depending on the mass of the droplets (Fig 1). Airborne transmission requires air currents for movement of lighter particles such as *Mycobacterium tuberculosis*, measles and chickenpox. This has not been found in COVID-19 transmission yet.

This is crucial information for applying the correct IPC procedures and ensuring safety of you and your patients.

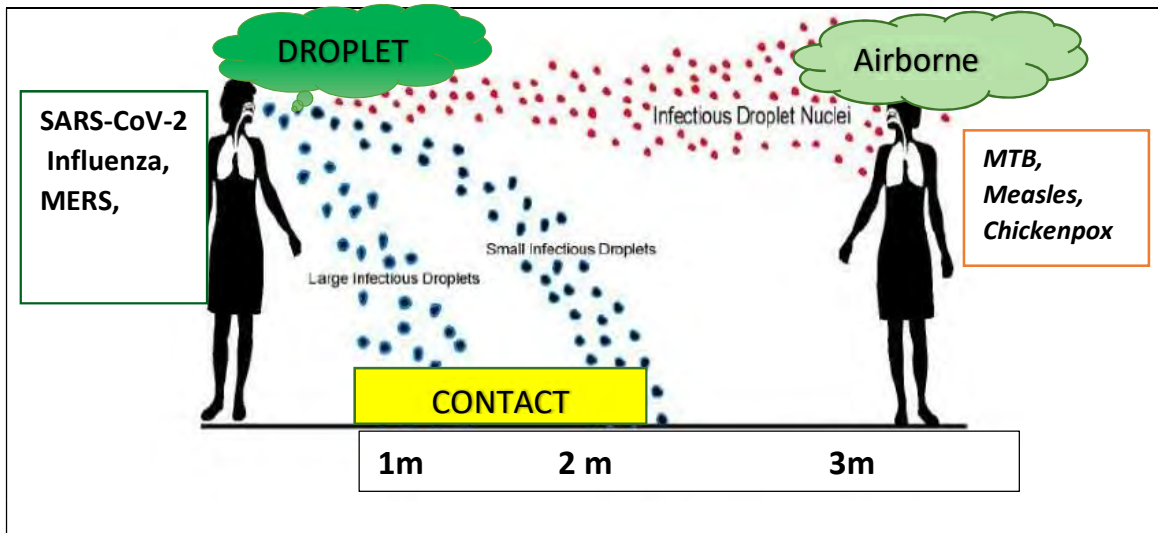


Figure 1: Illustrating the difference between the distance travelled between droplet and airborne after aerosol generation through coughing or sneezing

4. Administrative controls: IPC Precautions for COVID-19 containment in health care facilities

The hierarchy of IPC measures are outlined here and should be read in conjunction with the National Practice IPC Manual for the Implementation of the National IPC Strategic Framework (2020).

IPC Precautions: In addition to Standard Precautions, Droplet (and Contact) Precautions are recommended.⁵ For aerosol generating procedures, an N95 respirator for the health care worker (HCW) performing the procedure should be instituted.

³ WHO Coronavirus disease 2019 (COVID-19) Situation Report – 66; 26th March 2020

⁴ <https://www.who.int/news-room/commentaries/detail/modes-of-transmission-of-virus-causing-covid-19-implications-for-ipc-precaution-recommendations>

⁵ National Department of Health. National Practical Manual for the Implementation of the National Strategic Framework, March 2020. Available from: (<http://www.health.gov.za/index.php/antimicrobial-resistance/category/629-infection-prevention-and-control-documents>)

4.1. Roles and responsibilities of managers and staff

Containment and management of COVID-19 suspected and infected patients within health facilities depends on all staff members and patients understanding and adhering to the relevant policies and procedures.

4.1.1. All staff

- Frequent hand washing and use of alcohol based hand rub (ABHR)
- Correct cough etiquette and respiratory hygiene
- Social distancing. Keep a distance of up to 1.5 to 2m when in contact with other people
- Do not touch your face unless your hands are clean
- Personal Protective Equipment (PPE) should be procedure based
- It is not necessary to wear face masks if you are asymptomatic, or in self isolation

4.1.2. Laboratory staff

- Take the correct required samples and send to the laboratory for processing
- Ensure nasopharyngeal and other samples are processed and reported timeously

4.1.3. Clinical staff

- Implement effective management of patients (triage, isolation, treat promptly, discharge)
- Follow IPC protocols meticulously
- Use IPC equipment as indicated, to avoid unnecessary wastage

4.1.4. Facility IPC team

- Train HCWs on evidence-based IPC measures and the appropriate use of PPE
- Conduct IPC ward rounds regularly to ensure compliance.
- Carry out frequent audits on IPC practice and availability of supplies
- Report all IPC matters to the Infection Control Committee and other relevant groups
- Support clinical teams in implementing IPC practices
- Ensure proper cleaning of equipment
- Ensure that appropriate signage for COVID-19 is in place

4.1.5. Occupational health

- Evaluate HCWs at risk for COVID-19
- Monitor and report occupationally acquired SARS-CoV-2

4.1.6 Visitors

- Ideally, no visitors should be allowed to visit patients who have been admitted (see IPC controls below).
- Exceptions include the caregiver of an admitted child, and close family members of patients who are extremely ill. Any visitors should wear a surgical face mask and be instructed on hand and cough hygiene, as well as social distancing.

5. Environmental Controls for IPC measures in COVID-19

5.1 Patient Placement

Confirmed or suspected patients with COVID-19 not requiring ICU care should be accommodated either in a single room or in cohort isolation.

5.1.1 Single room

- Single occupancy room with en suite toilet facilities
- Natural ventilation of 60l/sec per patient or 6 ACH

5.1.2 Cohort isolation

- Bed distance must be 2m from the foot of one bed to the foot of the opposite bed so that the head of each bed is further than 2 m.
- A distance of at least 2.5m between the centre of one bed to the centre of the next bed or 1.5m from edge of one bed to the next.
- Shared toilet facilities must be cleaned regularly (2- 4 hourly).

5.2 Intensive Care

- Bed spacing- 3m or more to allow ease of movement of staff and equipment
- Good ventilation- 160L/sec/patient or 12 air changes per hour (ACH)
- Closed suctioning: use fresh sterile water each time to clean the suction catheter.
- Open suctioning - NOT RECOMMENDED
- Dedicated ventilator equipment with single patient use circuit
- Dedicated patient care equipment
- Carry out hand hygiene and change gloves after each patient contact
- Do not touch face, front of apron, mask, goggles or face shield during a clinical ward round
- Keep patient charts far from the patient's bed (outside the room, if possible)
- Always carry out hand hygiene before and after touching the notes (persistence on cardboard and paper reported)

5.3 The built environment

Water, sanitation and hygiene have a major role to play in IPC particularly in remote health facilities and clinics.⁶ Environmental Health practitioners should be consulted regarding these issues.

5.3.1 Ventilation

5.3.1.1 Hospital accommodation

- Where possible, natural ventilation is preferred giving air exchange of 60L/sec /patient.
- Mechanical ventilation, this must be checked by the engineers and records kept of airflow and air changes per hour (ACH) which should be a minimum of 6 ACH.
- IPC team to check airflow using a smoke test

5.3.1.2 Operating Theatres

Should a COVID-19 patient need surgery, the operating theatre ventilation must be checked for ACH and airflow. It is not necessary to convert the operating theatre into negative ventilation as long as there is sufficient air volume (160L/sec) changes (up to 24 ACH) to keep a high dilution factor particularly when carrying out AGP.

⁶ National Practical Manual for the Implementation of the National Strategic Framework, March 2020, p 129. Available from: (<http://www.health.gov.za/index.php/antimicrobial-resistance/category/629-infection-prevention-and-control-documents>)

5.3.1.3 Maternity-labour ward

- The delivery suites should have good bed spacing and ventilation.
- Operating rooms should be similar to conventional operating theatre environment

Mothers who are positive for SARS-CoV-2 are advised to wear face masks when feeding their baby for 14 days after their symptoms have resolved as mother to baby transmission via respiratory droplets can occur. There is no evidence of viral presence in breastmilk and breastfeeding is strongly encouraged.

6. IPC Controls for COVID-19 containment

Only the most salient features of IPC are described here. Please follow the IPC guidance in the National Practice IPC Manual for the Implementation of the National Strategic Framework (2020).

IPC Precautions: In addition to Standard Precautions, Droplet (and Contact) Precautions are recommended.³ For aerosol generating procedures, airborne precautions (including use of an N95 respirator for the HCW performing the procedure) should be instituted.

6.1 Standard Precautions⁷

Standard precautions are aimed at reducing the risk of transmission of microorganisms from recognized and unrecognized sources.

Patients and staff may serve as reservoirs for microorganisms, even if only colonised and not exhibiting any signs of infection. Standard Precautions are the basic level of infection prevention measures which apply to relevant health care delivered to all patients.

6.2 Transmission-based Precautions for COVID-19⁸

The type of transmission based precautions depend on the route of transmission. Table 1 summarises precautions for COVID-19 which are droplet and contact precautions.

Type	Recommendations	Alternatives
Patient placement	See Sections 5.1 and 5.2	Shared toilet facilities to be cleaned regularly (2- 4 hr)
Hand Hygiene	Before and after each patient contact (5 Moments of Hand Hygiene) Before wearing PPE After removing PPE	Use ABHR between patients if hands not visibly soiled
PPE - for contact and droplet precautions ⁹ Gloves non sterile, face mask, apron (or gown), goggles or face shield, N95 respirator (when performing aerosol generating procedures)		

⁷ National Practical Manual for the Implementation of the National IPC Strategic Framework, March 2020, p 13. Available form: (<http://www.health.gov.za/index.php/antimicrobial-resistance/category/629-infection-prevention-and-control-documents>)

⁸ National Practical Manual for the Implementation of National Strategic Framework, March 2020; p 115. Available form: (<http://www.health.gov.za/index.php/antimicrobial-resistance/category/629-infection-prevention-and-control-documents>)

⁹ Circular H25/20: Guidelines for PPE use during the coronavirus disease 2019 (covid-19) Western Cape Government: Health 25 March 2020

Environmental cleaning	Frequent cleaning 2- 3 times/ day. Water, detergent. Wipe over with disinfectant such as 1:1000 ppm available chlorine or 70% alcohol	Use universal wipes which is a combination of detergent and disinfectant.
Terminal cleaning	Remove all linen, healthcare waste and medical equipment and send for disinfection or discard. Clean with water and detergent. Wipe with disinfectant	Use universal wipes which is a combination of detergent and disinfectant
Patient care equipment	-Dedicated equipment. -Disposable where possible -Shared equipment to be heat or chemical disinfected after cleaning.	None
Linen	Change linen regularly. Send to laundry marked as infectious Temp 65- 70° C cycle	Disposable linen not recommended
Healthcare waste	Healthcare risk waste for secretions (infectious) PPE for handlers (see appendix A)	
Catering	Wash in automated dish washer. No additional precautions required	Wash in hot water and allow to dry.
Patient transportation	Patient to wear face mask during transfer Advise EMS patient has COVID-19 Transfer as a single case	Guidance for EMS and others when transporting patient
Visitors	Ideally <u>no visitors are allowed.</u>	Mother of admitted child or close family members of extremely sick patients should be allowed in with a surgical face mask. They should be instructed on hand hygiene and social distancing
Duration of isolation	Patient should remain in COVID-19 isolation area until discharge; Once discharged, patient to self-isolate for 14 days after first symptoms began (mild diseases) and for 14 days after clinical stabilisation (off oxygen, for moderate to severe disease.)	In some countries, resolution of symptoms plus two negative RT-PCR tests for SAR-CoV-2 is required for de-isolation. Given the shortage of test kits, South Africa has adopted clinical criteria for disease resolution and de-isolation.

Table 1: Contact and Droplet precautions for COVID-19 patients

6.3 Aerosol generating procedures (AGP)

During AGP, an N95 respirator should be worn with a gown and/ or plastic apron, single pair of non-sterile gloves and eye protection, either goggles or a face shield.

In high risk areas where AGPs are being conducted (e.g. ICU)

- Intubation, extubation and related procedures such as manual ventilation and open suctioning
- Tracheotomy/tracheostomy procedures (insertion/open suctioning/removal)
- Bronchoscopy
- Surgery and post-mortem procedures involving high-speed devices
- Some dental procedures (such as high-speed drilling)
- Non-Invasive Ventilation (NIV) such as Bi-level Positive Airway Pressure (BiPAP) and Continuous Positive Airway Pressure ventilation (CPAP)
- High-Frequency Oscillating Ventilation (HFOV)
- High Flow Nasal Oxygen (HFNO), also called High Flow Nasal Cannula
- Induction of sputum for laboratory test

In addition, the following are also considered AGP

- Collecting nasopharyngeal and oropharyngeal swabs;
- Chest physiotherapy;
- Reprocessing ventilator circuits and respiratory equipment;
- Cardiopulmonary resuscitation, including bag-mask ventilation;

6.4 IPC Signage

Clear signage should be posted at the entrance of all wards to inform all staff of IPC requirements and protocols (Fig 2).

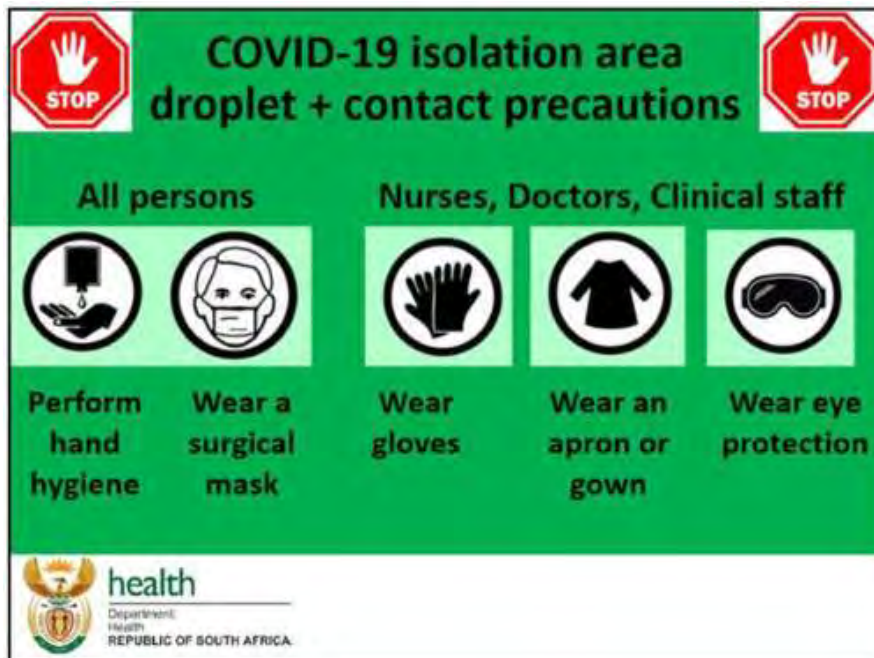


Figure 1: Signage for COVID-19

7. Hand hygiene

7.1 Why?

Hands are most frequently in touch with patients, surfaces and parts of the healthcare worker's body, such as the face, nose, and mouth (Fig 3). To remove microbes optimally, hands must be thoroughly and systematically washed paying special attention to the most contaminated areas, such as the fingers and thumbs. Follow the WHO 5 Moments of Hand Hygiene as outlined in the National IPC Manual.

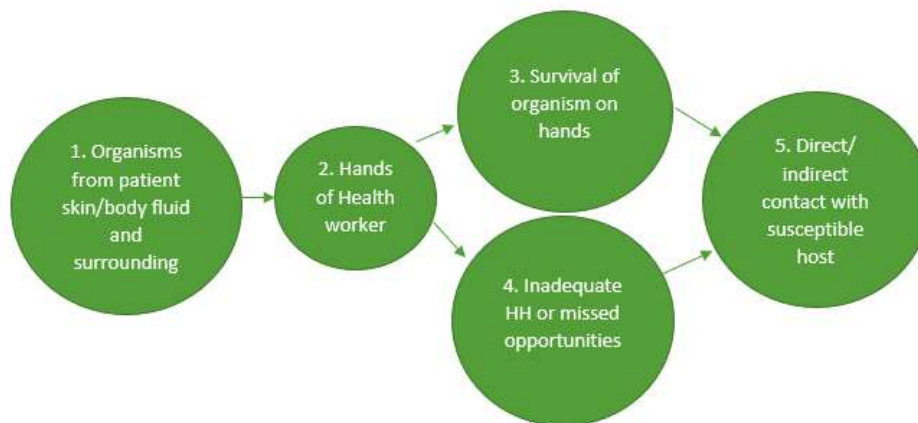


Figure 2: Transmission of pathogens via hands¹⁰ (National IPC Manual 2020)

7.2 Types of hand hygiene

- Hand washing with soap and water followed by drying.
- Use of alcohol-based hand rub (ABHR) containing 70% propyl or isopropyl alcohol with emollient. (See WHO guidance regarding local production¹¹).

Remember!!

- When washing hands, friction is necessary to remove transient microbes from the hands. (Fig 4)
- When using ABHR, make sure all surfaces are covered. Dip fingers in the ABHR in your palm and then move to the other surfaces (Fig 5)
- **Gloves do not offer total protection. ALWAYS WASH HANDS AFTER REMOVING GLOVES**
- **Never apply ABHR to gloves. It damages them and increases the risk of contamination**

¹⁰ National Practical Manual for the Implementation of the National Strategic Framework, March 2020. Available from: (<http://www.health.gov.za/index.php/antimicrobial-resistance/category/629-infection-prevention-and-control-documents>)

¹¹ Guide to local production: WHO recommended hand rub formulations (2009): available from https://www.who.int/gpsc/5may/Guide_to_Local_Production.pdf



Figure 3: Washing hands; start with palm to palm



Figure 4: Using (ABHR start with dipping fingers

8. Appropriate use of Personal Protective Equipment

Personal protective equipment (PPE) is specifically used to protect clinical and non-clinical health workers (including cleaners, ancillary staff and food service workers) from exposure to body fluids or from droplet or airborne pathogens, chemicals or heat. The use of PPE is based on risk assessment and evidence of the route of transmission for a given microbe.

8.1 Types of PPE to use

Table 2 sets out the generic PPE principles to decide on the appropriate PPE to use. There is no evidence that foot or head gear is indicated for protection against droplet and contact precautions and should be avoided.

See Appendix A for detailed recommendation for PPE use for:

- Inpatient services (hospital wards, ICU, overnight/holding wards, step-down facilities)
- Services at PHC facilities, outpatients, emergency units and temporary facilities
- COVID-19 patients cared for at home (or in hostels)
- Emergency medical services (EMS)
- Community health worker (CHC) services
- Forensic pathology services (FPS) and mortuary services¹²

¹² Circular H25/2020: Guidelines for PPE Use during the Coronavirus disease (COVID-19). Western Cape Government: Health. 25 March 2020

TYPE OF PPE	CLINICAL STAFF (nurses, doctors, EMS) Providing direct care to COVID-19 patients or patients with respiratory symptoms	NON-CLINICAL STAFF (admin staff, catering staff) coming into distant contact with COVID-19 patients and contaminated surfaces	NON-CLINICAL STAFF (cleaners) coming into distant contact with COVID-19 patients and contaminated surfaces	PATIENTS with RESPIRATORY symptoms	PATIENTS <u>without</u> RESPIRATORY symptoms
Gloves	Non-sterile gloves. Change between patients	Non-sterile gloves. Change when leaving COVID-19 area	Reusable long rubber utility cleaning gloves (ideally up to elbow) Change after completed cleaning contaminated area	None	None
Face cover	Surgical Mask for general care of COVID-19 patients N95 respirator for aerosol generating procedures on COVID-19 suspects/cases	Surgical mask when within <1m of a patient with respiratory symptoms (one per shift, if integrity maintained)	Surgical mask when within <1m of a patient with respiratory symptoms	Surgical mask worn when in contact with others	None
Aprons	Change when visibly contaminated. Discard after aerosol-generating procedure	Change when leaving COVID-19 area	After each work session (in absence of clinical contact)	None	None
Face shields, or visors, or goggles, or other eye covers	Wash clean, disinfect and reuse	None	Wash clean, disinfect and reuse	None	None

Table 2: Appropriate PPE use

8.2 Type of face covers¹³

Usually in healthcare only two types of face covers offer adequate protection to the healthcare worker, i.e. face mask and N95 respirators.

8.2.1 Face masks

Face masks (surgical, medical) are made of several layers of paper and protect against splashes and droplets. These are widely used in healthcare. Note the following guidelines:

- ✓ At any time if surgical masks are touched by unwashed hands, get wet, are soiled, or are removed from the face, they will become contaminated and will no longer provide effective protection. They should then be discarded.

¹³ National Department of Health. National Practical Manual for the Implementation of the National IPC Strategic Framework, March 2020. Available from: (<http://www.health.gov.za/index.php/antimicrobial-resistance/category/629-infection-prevention-and-control-documents>)

- ✓ Masks that are not wet, were not touched by unwashed hands and were not removed from the face, can be worn for up to 8 hours.
- ✓ COVID-19 patients when inside a dedicated COVID-19 ward, where staff are wearing PPE, do not need to wear masks.
- ✓ COVID-19 patients when outside a dedicated COVID-19 ward must always wear a surgical mask. The mask can be used for up to 8 hours.

8.2.2 N95 Respirators

N95 Respirators (FFP2, FFP3) are specifically designed to filter out smaller particles and are recommended for use in airborne precautions such as when dealing with TB, measles or chickenpox. Non-valved N95 respirators are recommended to prevent droplet transmission from the wearer.

Note the following guidelines:

- ✓ Seal tests should be performed each time a N95 respirator is used (i.e. when it is first put on)

Negative seal check:

- Coned shape respirator: Cup hands over respirator without excessive pressure. Breathe in sharply. A light collapse of the respirator should be felt with no air leaking in around the face-to-face piece seal.
- Duck-bill and V-flex type respirator: Breathe in sharply. The respirator should collapse inwards.

+ Positive seal check:

- Coned shape respirator: Cup hands over respirator. Blow out. A build-up of air should be felt with no air leaking out around the face-to-face piece seal edges of the device.
- Duck-bill and V-flex type respirator: Breathe out forcefully; the respirator should expand on the exhale.

- ✓ N95 respirators should ideally be used once only and should be discarded once safely removed. However, as there is a global shortage of N95 respirators, reuse is strongly encouraged and is preferable to having no respirator.
- ✓ If HCWs are performing aerosol-generating procedures (e.g. sample collection) on several COVID-19 patients sequentially, they may use the same N95 respirator and eye protection for the session; **they must however change apron and gloves between patients.**
- ✓ As the outside surface of the N95 respirator will become heavily contaminated with the virus during aerosol-producing procedures, HCWs should take great care not to touch the outside surface and must perform careful hand hygiene after removing it.
- ✓ For reuse:



Without touching the respirator, slowly lift the bottom strap from around your neck up and over your head.



Lift off the top strap. Do not touch the respirator.



Store respirator in a paper bag with your name on it. Do not crush the respirator when storing it.

- ✓ Do NOT attempt to disinfect the N95 respirator as this destroys its integrity.
- ✓ Note that obviously damaged and visibly contaminated respirators cannot be reused.

8.2.3 Cotton masks for healthcare workers

Cotton masks are not indicated for healthcare work because there is no filtration or protection against droplets or splashes. There is also the “wicking effect” which increases the risk of mucous membrane contamination

8.3 Extended use of PPE

Usually PPE is discarded after a single patient or procedure, however, because of an acute shortage of PPE during the COVID-19 outbreak, the WHO and CDC are considering extended use and/or reuse of certain PPE. For South Africa, it is recommended that the extended use of PPE is preferable to reprocessing, the latter being expensive, not validated and the integrity of the PPE cannot be guaranteed (Table 3).

Type of PPE	Extended use	Reprocess
Gloves (non-sterile)	No	No
Face masks	Yes. Until damp or torn, or to end of shift. Change if contaminated	No
N95 respirators	Yes. Up to 1 week for same HCW (as TB protocol), unless respirator integrity or leak-proof seal is compromised	Pending (WHO)
Aprons	Yes, if not visibly contaminated (maintain 1m distance)	No
Gown Cotton gowns and aprons	Water resistant - yes if not visibly contaminated (1m)	Yes - launder cotton
Goggles	Yes but do not contaminate hands	Yes - wash with soap and water. Dry. Wipe over with alcohol wipes
Face shields	Yes, but do not contaminate hands	Yes - wash with soap and water. Dry. Wipe over with alcohol wipes

Table 3: Extended or reprocessing of PPE

8.4 Donning and doffing of PPE¹⁴

A video demonstrating the correct sequence to put on (Don) and remove (Doff) PPE can be downloaded from:

https://player.vimeo.com/external/400607941.hd.mp4?s=af075e8c9647a23114424834c1e73f866a73e5f7&profile_id=174&download=1

The poster summarises the correct way to put on and take off PPE. (Fig 6)

Dispose of all PPE in an infectious waste container.

¹⁴ Circular H25/20: Guidelines for PPE use during the coronavirus disease 2019 (covid-19) Western Cape Government: Health 25 March 2020

WASH HANDS OR USE AN ALCOHOL-BASED HAND SANITISER AFTER REMOVING GLOVES AND AFTER REMOVING ALL PPE

SEQUENCE FOR PUTTING ON PERSONAL PROTECTIVE EQUIPMENT (DONNING)	SEQUENCE FOR TAKING OFF PERSONAL PROTECTIVE EQUIPMENT (DOFFING)
Wash your hands before putting on the PPE. PPE should be put on in an order that minimises contamination. The apron, mask, goggles and gloves must be put on in that order. See guidance on each below.	Wash your hands before taking off the PPE. PPE should be removed in an order that minimises contamination. The gloves, apron, goggles/visor, and mask must be removed in that order.* Wash your hands after taking off the PPE. Discard PPE in infectious waste container. See guidance below.
Apron • Wash hands • Slip it over the head and tie the strings behind the back 	Gloves • Securely grasp the outside of glove with the opposite gloved hand; peel off; discard as infectious waste • Slide the fingers of the un-gloved hand under the remaining glove at the wrist; peel off; discard as infectious waste 
Mask or N95 Respirator • Secure each tie or elastic at the middle of head and neck • Fit flexible band to nose bridge • Fit snug to face and below chin • Fit-check respirator by blowing into it (air should not leak out) 	Apron or Gown* (See Note) • Wash hands • Unfasten or break apron/gown ties • Pull the apron away from the neck and shoulders, touching the inside of the apron only and bring it forward and over the head • Turn the apron inside out, fold or roll into a bundle and discard as infectious waste 
Goggles or Visor • Place over face and eyes • Adjust band to fit comfortably 	Goggles or Visor* (See Note) • Remove goggles/visor from the back by lifting head band or ear pieces • Place in designated receptacle for disinfecting 
Gloves • Hold the edge of the glove as you pull it over your hand • Extend to cover wrist • Once gloved, do not touch other surfaces	Mask or N95 Respirator • Untie or break bottom ties, followed by top ties or elastic. • Remove by handling the ties only and discard as infectious waste. • Wash hands 
*Note. When it is practically difficult to remove the apron/gown before the visor/goggles, then the visor/goggles may be removed before the apron/gown.	

Figure 5: Poster for donning and doffing of PPE

8.5 Norms for PPE requirement

The amount of PPE and hand hygiene products needed per healthcare worker per shift is difficult to assess but should be calculated and adequate stocks must be available to ensure the safety of the staff. Table 4 illustrates a rough example of what might be needed as stock per healthcare worker per day or per 12-hour shift. Example: 10 patients allocated per HCW per 12-hour shift

Predicted PPE + consumable usage per day for a hypothetical 30-bed COVID-19 ward and a 30-bed COVID-19 ICU

Type of PPE or consumable	Calculation	Predicted usage per day (COVID-19 ward)	Predicted usage per day (COVID-19 ICU)
Handrub* (3ml per time)	4-8 HH opportunities per hour X 24 hrs x 30 pts	3 litres	6 litres
Liquid hand soap (3ml per time)	2-4 HH opportunities per hour X 24 hrs x 30 pts	1.5 litres	3 litres
Paper towels (after soap and water)	2-4 HH opportunities per hour X 24 hrs x 30 pts	1500 paper towels	3000 paper towels
Non-sterile gloves (change between patient contact)	1-2 pairs per hour x 24 hrs for care of 30 patients	720 pairs	1440 pairs
70% alcohol (for disinfection of equipment)	30-bed ward vs ICU	2 litres?	4 litres?
0.5% sodium hypochlorite (for surface disinfection)	30-bed ward vs ICU	10 litres	15 litres
Goggles/visors	Clean + disinfect and share between shifts	20 googles	40 goggles
Plastic aprons (change if contaminated + after AGP)	2-4 required for care of each patient x 30	60 aprons	120 aprons
Cotton gowns with apron (alternative to apron alone for ICUs)	Allocate 2 per HCW per shift (1 extra for laundry)	60 cotton gowns	120 cotton gowns
Surgical face masks (for HCW use)	Allocate 2 per HCW per shift; replace when wet, damaged or contaminated	60	120
N95 respirator (for AGP only)	Allocate 1 per HCW per shift for AGP; N95 can be reused if integrity ok	30	60
Water resistant gowns (for AGP only)	Disposable after AGP	30	60
HH = hand hygiene, HH* use of alcohol-based hand rub is preferred to save time, unless hands are visibly soiled, AGP = aerosol-generating procedures; note: frequency of patient contact is much higher in ICU settings with at least a doubling of usage for ABHR, gloves, aprons to be expected. Note 2: revision of PPE extended use and re-use guidance may reduce the predicted amount of PPE required.			

Table 4: Example of what might be needed as stock per healthcare worker per day or per 12-hour shift

9. Environmental cleaning

Human coronaviruses can remain infectious on surfaces for up to 9 days. COVID-19 virus has been detected after up to 72 hours in experimental conditions.¹⁵ Therefore, cleaning the environment is paramount and is covered in detail in the National IPC Manual (2020).

To summarise, each area of the healthcare facility must be cleaned at least twice daily, with a proper schedule, checklist and programme. The cleaning can be **validated** using visual inspection and fluorescent markers. In high risk areas (COVID-19 triage, isolation ward and ICU settings), the environment must be cleaned and disinfected at least 3-4 times per day and checked by the supervisor each time.

Following thorough cleaning, surfaces are wiped (NOT SPRAYED) with disinfectants such as 1:1000 ppm chlorine or 70% alcohol, as recommended. Universal wipes which combine cleaning and disinfection are impregnated with peracetic acid and or hydrogen peroxide and may be used but these are expensive. Hypochlorite must be used at the correct dilution to ensure maximum efficacy (Table 5).¹⁶

Product	Chlorine available	How to dilute to 0.5%	How to dilute to 1%	How to dilute to 2%
Sodium hypochlorite – liquid bleach	3.5%	1 part bleach to 6 parts water	1 part bleach to 2.5 parts water	1 part bleach to 0.7 parts water
Sodium hypochlorite – liquid bleach	5%	1 part bleach to 9 parts water	1 part bleach to 4 parts water	1 part bleach to 1.5 parts water
NaDCC (sodium dichloro-isocyanurate) – powder	60%	8.5 grams to 1 litre water	17 grams to 1 litre water	34 grams to 1 litre water
NaDCC (1.5g/tablet) - tablets	60%	6 tablets to 1 litre water	11 tablets to 1 litre water	23 tablets to 1 litre water
Chloramine - powder	25%	20 grams to 1 litre water	40 grams to 1 litre water	80 grams to 1 litre water

Table 5: Method for diluting hypochlorite requiring different concentrations

Environmental spraying of buildings, roads, and dwellings with chlorine is not recommended. There is no evidence that transmission from these areas occurs.

¹⁵ Kampf G, Todt D, Pfaender S, Steinmann E. Persistence of coronaviruses on inanimate surfaces and their inactivation with biocidal agents. Journal of Hospital Infection. 2020;104(3):246-51 <https://doi.org/10.1016/j.jhin.2020.01.022> (accessed March 22, 2020).

¹⁶ National Department of Health. National Practical Manual for the Implementation of the National IPC Strategic Framework, March 2020, p 93. Available from: (<http://www.health.gov.za/index.php/antimicrobial-resistance/category/629-infection-prevention-and-control-documents>)

10. Bodies, burial and post mortem

10.1 Dead Bodies

The WHO recommendations for a person dying of COVID-19 have been published¹⁷

- The dignity of the dead, their cultural and religious traditions, and their families should be respected and protected throughout;
- To date there is no evidence of persons having become infected from exposure to the bodies of persons who died from COVID-19
- Before attending to a body, ensure that the necessary hand hygiene and personal protective equipment (PPE) supplies are available for standard precautions including hand hygiene, appropriate use of PPE, and environmental cleaning,
- PPE for routine use will be gloves and apron, however if there is a risk of splashing, face protection, such a face mask, face shield or goggles may be worn
- After removing all medical devices, ensure that any leaking from orifices are contained
- Keep movement and handling of the body to a minimum
- Wrap body in cloth (shroud) and transfer it as soon as possible to the mortuary area;
 - There is no need to disinfect the body before transfer to the mortuary area;
 - Body bags are not necessary, although they may be used for other reasons (e.g. excessive body fluid leakage); and
 - No special transport equipment or vehicle is required.

Health care workers or mortuary staff preparing the body (e.g. washing the body, tidying hair) should wear appropriate PPE (gloves, water resistant disposable gown, face mask, eye protection);

If the family wishes to view the body, they may do so, using standard precautions. They are not allowed to touch or kiss the body. Embalming is not recommended to avoid excessive manipulation. Adults >60 years and immunosuppressed persons should not directly interact with the body.

10.2 Post mortem (autopsy)

If a person died during the infectious period of COVID-19, the lungs and other organs may still contain live virus, and additional respiratory protection is needed during aerosol-generating procedures (e.g. procedures that generate small-particle aerosols, such as the use of power saws or washing of intestines);

- Perform autopsies in an adequately ventilated room, i.e. at least natural ventilation with at least 160 L/s/patient air flow or negative pressure rooms with at least 12 air changes per hour (ACH)
- Controlled direction of air flow when using mechanical ventilation
- Only a minimum number of staff should be involved in the autopsy;
- Appropriate PPE must be available as per departmental protocol, including a scrub suit, long sleeved fluid-resistant gown, gloves (either two pairs or one pair autopsy gloves), and face shield (preferably) or goggles, and boots. An N95 respirator should be used in the case of aerosol-generating procedures.
- The mortuary must be kept clean and properly ventilated at all times;
- Lighting must be adequate. Surfaces and instruments should be made of materials that can be easily disinfected and maintained between autopsies;

¹⁷ Infection Prevention and Control for the safe management of a dead body in the context of COVID-19. WHO interim guidance, 24th March 2020

- Instruments used during the autopsy should be cleaned and disinfected immediately after the autopsy, as part of the routine procedure;
- Environmental surfaces, where the body was prepared, should first be cleaned with soap and water, or a commercially prepared detergent solution; After cleaning, a disinfectant with a minimum concentration of 0.1% (1000 ppm) sodium hypochlorite (bleach), or 70% ethanol should be used.

10.3 Family member

- Any person (e.g. family member, religious leader) preparing the deceased in a community setting should wear gloves for any contact with the body. For any activity that may involve splashing of bodily fluids, eye and mouth protection (face shield or goggles and medical mask) should be worn.
- Clothing worn to prepare the body should be immediately removed and washed after the procedure, or an apron or gown should be worn;
- The person preparing the body should not kiss the deceased.
- Family and friends may view the body after it has been prepared for burial, in accordance with customs.
- The belongings of the deceased person do not need to be burned or otherwise disposed of.
- Clothes can be laundered and reused.

11. Repatriation and subsequent quarantine

A guideline on repatriation, quarantine of returning South African Citizens and others has already been developed and circulated.¹⁸

12. Summary

These guidelines are subject to change as the situation with COVID-19 develops in South Africa. The guidelines will be updated regularly based on new evidence and WHO recommendations.

¹⁸ National Department of Health. South African Guidelines for quarantine facilities and isolation in relation to COVID-19. March 2020

Appendix A: Detailed recommendation for use of PPE¹⁹

Inpatient Services (hospital wards, ICU, overnight/holding wards, step-down facilities)			
Setting	Target Personnel or Patients	Activity	Type of PPE or Procedure
Isolation cubicles, rooms, or wards where COVID-19 patients are being cared for.	Patients with COVID-19	Any	Surgical Mask
	Clinical staff	Providing direct care to COVID-19 patients	Surgical Mask Apron Non-sterile Gloves Eye protection (goggles or visor)
	Clinical staff	Aerosol-generating procedures* performed on COVID-19 patients (such as nasopharyngeal and oropharyngeal swabbing for testing for coronavirus infections) N95 respirators** are only worn when performing aerosol producing procedures	N95 Respirator Apron or gown Non-sterile Gloves Eye protection (goggles or visor)
	Body of deceased	Death of COVID-19 patient	Wrap body with sheets as per usual
	Cleaners	Entering the cubicle or room or ward of COVID-19 patients	Surgical mask Apron Long rubber utility cleaning gloves (ideally up to elbow) that can be washed Eye protection (goggles or visor) Closed work shoes
	Porters and nurses	Transport of COVID-19 patients	Surgical Mask Non-sterile Gloves
	Catering staff	Providing meals inside COVID-19 ward	Surgical Mask Non-sterile Gloves
	Administrative personnel	Administrative staff supporting COVID-19 ward services, who are not usually in direct contact with patients, but would enter the isolation ward.	Surgical mask Non-sterile Gloves Maintain spatial distance of at least 1 metre, where possible
	Security personnel	Any	Surgical mask
	Laundry workers	Laundering of COVID-19 patient linen	Linen to be bagged separate from other linen Surgical mask Apron Long rubber utility cleaning gloves (ideally up to elbow) that can be washed

¹⁹ Circular H25/20: Guidelines for PPE use during the coronavirus disease 2019 (COVID-19) Western Cape Government: Health 25 March 2020

			Eye protection (goggles or visor) Closed work shoes
All types of wards where Non-COVID-19 Patients (i.e. patients who do NOT have COVID-19) are being cared for	Patients without COVID-19	Any	No PPE required
	Clinical staff	Aerosol-generating procedures* performed on Non-COVID-19 patients*	Surgical mask Apron Non-sterile Gloves Eye protection (goggles or visor)
	All staff	Any other activity besides Aerosol-generating procedures performed for Non-COVID-19 patients	No PPE required
	Visitors	Visiting patients without COVID-19	No PPE required
Other areas of the hospital where COVID-19 patients transit (e.g. corridors) but are not directly attended to.	All staff	Any activity that does not involve contact with COVID-19 patients	No PPE required

* Aerosol-generating procedures (see above)

**N95 respirator must still be used for all other Non-COVID-19 indications (e.g. when attend to a patient with confirmed or suspected TB)

PHC Facilities, Outpatients, Emergency Units and Temporary facilities			
Setting	Target Personnel or Patients	Activity	Type of PPE or Procedure
Triage at Clinics, CHC, OPD. Emergency Units and temporary facilities entrances	Clinical staff	Triage: Preliminary screening of patients (via questions on symptoms and contact with COVID-19 cases) as they enter unit.	Maintain spatial distance of at least 1 metre Surgical mask
	Patients and escorts who screen positive	While waiting for testing	Move patient to isolation room Provide Surgical mask
	Patients and escorts who screen negative but have respiratory symptoms	While waiting for consultation	Maintain spatial distance of at least 1 metre. Provide Surgical mask
	Patients and escorts who screen negative but without respiratory symptoms	While waiting for consultation	No PPE required
Administrative areas	All staff including reception, clerical and clinical staff	Administrative tasks that do not involve contact with COVID-19 patients	No PPE required
Clinic, CHC, OPD, Emergency Unit and Temporary facility Consultation rooms	Clinical staff	Physical examination of suspected COVID-19 patients	Surgical Mask Eye protection (goggles or visor) Apron Non-sterile Gloves
	Clinical staff	Aerosol-generating procedures performed on suspected COVID-19 patients (such as nasopharyngeal and oropharyngeal swabbing for testing for coronavirus infections) Note that N95 respirators are only worn when performing aerosol-generating procedures	N95 Respirator Apron or gown Non-sterile Gloves Eye protection (goggles or visor)
	Clinical staff	Physical examination of patients without respiratory symptoms.	No PPE required
	Cleaners	Cleaning the vacated room and areas used by a COVID-19 patient	Surgical mask Apron Eye protection (goggles or visor) Long rubber utility cleaning gloves (ideally up to elbow) that can be washed Closed work shoes
	Body of deceased	Death of COVID-19 patient	Wrap body with sheets as per usual
Entrance to COVID-19 Area	Security personnel.	Any	Surgical mask

COVID-19 patients cared for at home (or in hostels)			
Setting	Target Personnel or Patients	Activity	Type of PPE or Procedure
Private home or hostel	Patient with COVID-19	When in contact with others	Surgical mask.
	Caregiver (family members and other caregivers)	Direct contact with COVID-19 patients.	Surgical mask Apron. Non-sterile gloves. Eye protection (goggles or visor)
	Contact tracers and Medical response teams	Direct contact with COVID-19 and suspected COVID-19 patients	Surgical mask (ideally with visor) Apron. Non-sterile gloves.
	Body of deceased	Death of COVID-19 patient	Wrap body with sheets

Emergency Medical Services (EMS)			
Setting	Target Personnel or Patients	Activity	Type of PPE or Procedure
Ambulance/transfer vehicle	Clinical staff	Care for and transport of suspected COVID-19 patients to a referral health care facility	Surgical mask A40 suit (apron not practical when worn outside, especially if windy) Non-sterile Gloves Eye protection (goggles or visor)
	Clinical staff	Intubation and suctioning of suspected COVID-19 patients	N95 Respirator A40 suit (apron not practical) Non-sterile Gloves Eye protection (goggles or visor)
	Suspected COVID-19 patient	While being transported	Surgical mask
	Cleaners	Cleaning the vehicle after transport of suspected COVID-19 patients to the referral facility	Surgical mask Apron Eye protection (goggles or visor) Long rubber utility cleaning gloves (ideally up to elbow) Closed work shoes

Community Health Worker (CHW) Services			
Setting	Activity	CHW PPE	People/Patient PPE
Field: Outdoor points (bus or taxi rank) and Indoor points (mall)	Distributing educational materials	Maintain at least 1m distance from people. No PPE required	Maintain at least 1m distance from people. No PPE required
Field: In communities but outside homes	Distributing educational materials	Maintain at least 1m distance from people. No PPE required	Maintain at least 1m distance from people. No PPE required
	Distributing chronic medication and general supplies	Maintain at least 1m distance from people. No PPE required	Maintain at least 1m distance from people. No PPE required
Inside homes	Assisting patient who has COVID-19 with or without any other diseases (CVA, chronic ulcer, septic wound, etc.) except for TB	Surgical mask (single use; ideally with visor) Gloves (single use) Apron (single use) Alcohol-based hand sanitiser (use before and after remove and discard gloves, apron and mask) Infectious waste disposal plastic bag	Surgical mask
	Assisting TB patient who does NOT have COVID-19	N95 Respirator (single use) Alcohol-based hand sanitiser Infectious waste plastic bag	No PPE required
	Assisting TB patient who DOES have COVID-19	N95 Respirator (single use) Gloves (single use) Apron (single use) Alcohol-based hand sanitiser Infectious waste plastic bag	Surgical mask
	Assisting patient with respiratory symptoms	Surgical mask (single use) Gloves (single use) Alcohol-based hand sanitiser Infectious waste plastic bag	Provide surgical mask to patient
	Assisting patient without respiratory symptoms	Maintain 1m distance from patient.	No PPE required

Forensic Pathology Services (FPS) and Mortuary Services			
Setting	Target Personnel or Patients	Activity	Type of PPE or Procedure
Private home, hostel or hospital	Caregivers, hospital staff, mortuary staff transporting and preparing the body and Forensic Pathology staff transporting the body	Direct contact with deceased COVID-19 and suspected COVID-19 patients	Surgical Mask Apron or gown Non-sterile Gloves Eye protection (goggles or visor)
	Body of Deceased COVID-19 patients	Deceased body being removed	Usual procedures for removing body
FPS vehicle used to transport deceased	Cleaner	Cleaning of vehicle	Surgical mask Apron Eye protection (goggles or visor) Long rubber utility cleaning gloves (ideally up to elbow) that can be washed Closed work shoes
Mortuary	Forensic pathology staff	Conducting autopsy (if required)	N95 Respirator Gown Apron Eye protection (goggles or visor) Double gloves Cut-proof synthetic mesh gloves Closed work shoes